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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/085,338	02/27/2002	Srinivas Gandikota	AMAT/6346.02/CPI/COPPER/P	8528

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EXAMINER

LEADER, WILLIAM T

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 03/24/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/085,338	Applicant(s) GANDIKOTA ET AL.	
	Examiner William T. Leader	Art Unit 1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 28-36 is/are pending in the application.
- 4a) Of the above claim(s) 1-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 28-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>02/28/02; 09/15/03</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's election with traverse of Group II, claims 28-36 in the paper filed on January 2, 2004, is acknowledged. The traversal is on the ground(s) that the claims recite substantially similar limitations. While there is no limitation in claim 1 requiring positioning the bleed line to be at a position above the anode, and there is no limitation in claim 28 that a check valve be included, it has been found that all claims can be expeditiously examined together.

Specification

2. The disclosure is objected to because of the following informalities:

Paragraph [0033] at page 17 refers to figure 8. However, only 7 drawing figures have been presented. The Brief Description of the Drawings section on pages 7 and 8 describes only five of the seven figures submitted.

At paragraph [0011], line 3 and paragraph [0012], line 4 "nine" should apparently be --non--.

Appropriate correction is required.

Claim Objections

3. Claim 2 is objected to because of the following informalities: In line 2 “in” (first occurrence) should be -- is--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 9 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 9 recites that the bleed line is configured to completely drain the plating bath. However, claim 9 is dependent on claim 3, which is dependent on claim 2. Claim 2 recites that the bleed line is positioned in a side wall of the plating cell and is configured to drain a portion of the plating bath. The limitations of claim 2 and claim 9 appear to be inconsistent.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 1 and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Hongo et al (6,517,894).

8. The Hongo et al patent is directed to the deposition of a metal such as copper onto a semiconductor substrate. Apparatus for carrying out the deposition is shown in figure 5. The apparatus includes plating cell 20 which contains the plating bath. While a substrate support to allow contact of the plating solution with the substrate is not illustrated in figure 5, Hongo et al teach that the that substrate is immersed in the plating solution (column 2, lines 46-47). First plating solution supplying section 22a includes a fluid supply line in communication with the plating cell. A valve 25a is provided in the supply line. The valve may be controlled by timer 26a.

Discharge tube 28 is provided at the bottom of cell 20 and would allow the plating solution to be bled from the tank. All elements recited in instant claim 1 are taught by Hongo et al. Instant claim 9 requires the bleed line be configured to completely drain the plating bath. By positioning the discharge tube at the bottom of the tank as shown in figure 5, the apparatus of Hongo et al is configured to completely drain the tank.

9. Claims 1, 2 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Uzoh et al (6,113,769).

10. The Uzoh et al patent is directed to apparatus for electroplating onto substrate such as semiconductor wafers. The apparatus is illustrated in figure 1 and includes plating cell 3, fluid supply line 55, selectively actuated valve 57 which is controlled by controller 33 through connection 59, and bleed line 54 in the bottom of the cell which is connected to recirculation pump 53, and bleed line 37 located in the side of the cell. See column 5, lines 3-9 and column 7, lines 9-23. While Uzoh et al do not specifically illustrate a substrate support to contact the substrate with the plating bath, Uzoh et al teach that the substrates are introduced into the plating bath 3 (column 3, lines 38-39). Thus, Uzoh et al teach each element in claim 1. By locating the bleed line 37 at the side of the tank as shown in figure 1, the apparatus of Uzoh et al is configured to drain a portion of the plating bath as recited in instant

claim 2. By including bleed line 54 at the bottom of the tank, the apparatus of Uzoh et al is configured to completely drain the tank as recited in instant claim 9.

11. Claims 28 and 29 are rejected under 35 U.S.C. 102(b) as being anticipated by Woo et al (6,103,085).

The Woo et al patent is directed to electroplating metal on semiconductor workpieces. Apparatus for carrying out the deposition is shown in figure 1. The apparatus includes a plating cell, a substrate support capable of allowing contact of the workpiece with the plating bath, fluid supply line 14 in fluid communication with the plating cell, anode 5 in the plating cell, and bleed line 12 in fluid communication with the plating cell and positioned above anode 5. A bleed line is taken to be any line which allows plating solution to be removed, or bled, from the plating cell. All elements recited in instant claim 28 are taught by Woo et al. Claim 29 recites that the bleed line is configured to drain a portion of the plating bath while leaving a sufficient amount of plating bath in the plating cell to immerse the anode. Bleed line 12 of Woo et al is configured so that it is capable of performing this function.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claims 1-8 and 28-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woo et al (6,103,085) in view of Adams et al (6,143,155).

The apparatus of claim 1 differs from Woo et al by reciting a check valve in the fluid supply line. The Adams et al patent is directed to a process for electrodeposition onto a semiconductor workpiece. Adams et al teach that the

process chemicals can be recirculated with or without replenishment or purification (column 11, lines 21-23). A system for controlling plating solution flow is shown in figure 8 and described at column 10, line 66 to column 11, line 35. The system includes valves 685 and 735 in the fluid supply and bleed lines. Additionally, figure 8 shows control computer 610 which communicates with and controls the pumps and valves of the system to manipulate fluid flow.

The prior art of record is indicative of the level of skill of one of ordinary skill in the art. Figure 1 of Woo et al depicts recirculation without replenishment or purification. It would have been obvious at the time the invention was made to have provided for the replenishment and purification of the plating solution of Woo et al as taught by Adams, including a control valve in the fluid supply line, because the quality of the deposit formed on the semiconductor would have been improved. In the rejection of claims 28 and 29 above, a bleed line is taken to be any line which allows plating solution to be removed, or bled, from the plating cell. If line 12 of Woo et al is not considered to be a bleed line, it would have been obvious to have configured line 12 to feed a plating solution replenishment and purification device as taught by Adams et al because the quality of plating would have been improved by increasing the quality of the plating solution.

Line 12 of Woo et al is located in a side wall of the plating cell proximate the top of anode 5 and would allow electrolyte to be drained from the cell while leaving


a sufficient amount of electrolyte in the plating cell to immerse the anode as recited in instant claims 2-4. As noted above, Adams et al shows inclusion of valves in the fluid supply and bleed lines as recited in instant claims 30 and 32. Since a valve may be opened or closed, the valves allow selective activation as recited in instant claims 5, 31 and 33. Control computer 610 of Adams et al corresponds to the microprocessor-type controller recited in instant claim 6. It would have been obvious to have included the additional valves and the computer control disclosed by Adams et al in the apparatus of Woo because the apparatus would have allowed the plating solution to be purified and control of the electroplating process to be improved. Provision of the control system of Adams et al in the apparatus of Woo et al would have allowed the functions recited in instant claims 7-9 and 34-36 to have been performed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


William Leader
March 16, 2004


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